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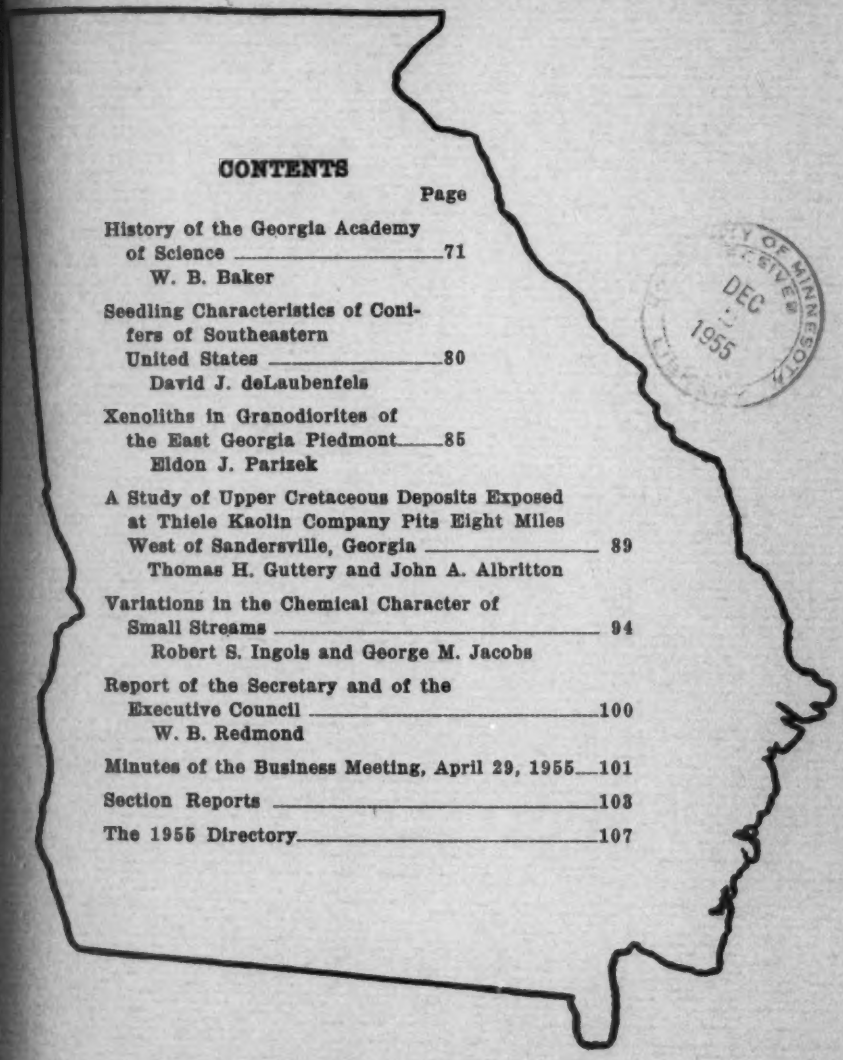

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BULLETIN OF
GEORGIA ACADEMY OF SCIENCE

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THE BULLETIN of the GEORGIA ACADEMY OF SCIENCE is published four times each year, in January, April, June and September and is sent without charge to all members of the Academy.

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HISTORY OF THE GEORGIA ACADEMY OF SCIENCE

Period II. 1932-1942. Period of Growth and Development.[1]

W. B. Baker, *Historian*

Having completed ten years (1922-1932) of fruitful activity as a factor in bringing about cooperation between the scientists of the state and developing interest in science in general and having increased the membership of the Academy slowly and conservatively the leaders began to consider the advisability of expanding the organization.

The continued development of interest in science coupled with the growth and expansion of the institutions in which the sciences were emphasized indicated that a review be made of the organization of the Academy as originally set up with the object in mind of broadening its activities and extending its influence.

With the same conservatism which characterized the members during the period of organization (1922-1932) studies were undertaken and plans formulated for future development.

Particular credit should be given to the secretaries of the Academy who have served so faithfully and well during its entire history. It is recognized that the responsibility for carrying on the various activities between annual meetings as well as giving continuity to the execution of plans and instructions of the executive council rests on the shoulders of the secretary.

The first secretary serving from 1922 through 1925 was Dr. Henry Fox, Professor of Biology at Mercer University. Succeeding him was Dr. David F. Barrow of the University of Georgia who served until 1929 when Dr. Geo. H. Boyd of the University of Georgia was elected and served until 1942.

Since the Academy was attempting to broaden the sphere of its influence, increase its membership, strengthen its programs and encourage greater participation of high school students in scientific activities, the duties of the secretary became increasingly arduous and complex during the period between 1932-1942. That Dr. Boyd assumed these responsibilities with his characteristic thoroughness is attested by the accuracy and completeness of the minutes kept during his period of office. In addition to the regular routine of duties the Executive Council voted in 1935 (March 22) that

> "the secretary of the Academy be made Council Representative (A.A.A.S.) to serve from year to year and that for each meeting attended a stipend not to exceed $25.00 be authorized by the Academy to help meet his expenses."

Thus Dr. Boyd became the official representative before the A.A.A.S. and other national groups. Much of the success of the expansion program of the Georgia Academy during the period 1932-42 may be said to be the result of Dr. Boyd's experiences in meetings with

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1. The previous section of this history covering Period I was published in Volume 12, Number 1, January 1954, of the Bulletin.

other academy representatives for discussion of mutual problems. Dr. Boyd resigned in 1942 and Dr. A. S. Edwards of the University of Georgia was elected to succeed him.

Dr. Edwards entered upon his duties with a broad background of experience in Academy affairs having served three years (1930-33) as councilman, one year as vice-president (1934-35), one year as president (1935-36), and in addition was a member of several important committees. Not only did Dr. Edwards prove to be a most efficient leader in carrying to completion many of the plans made during Dr. Boyd's administration but demonstrated his executive ability in keeping the affairs of the Academy in order during the difficult war period. He stimulated what might have become a lagging interest, spent much time in getting interesting programs for the annual meetings, and through the publication of an academy bulletin which he started in 1943 and continued throughout his term of office he was able to contribute a great deal to its continued development.

Dr. Edwards resigned in 1952 and Dr. W. B. Redmond of Emory University who was elected to succeed him, served most efficiently until 1955, performing not only the duties inherited from his predecessors but assuming several additional ones. Dr. Redmond resigned in 1955 to give more time to his duties as editor of the Bulletin of the Academy. Dr. Marion Clark of Emory was elected secretary.

As in the case of Drs. Boyd and Edwards, Dr. Redmond assumed his duties as secretary after having served the Academy in varying capacities. He was elected to the Council in 1943 for a three year term, and in 1946 was elected vice-president, and in 1947 became president. Upon the death of Dr. Rhodes, the historian, Dr. Redmond was elected to serve the unexpired term. During his term as president he became particularly interested in enlarging the membership and in 1949 was made chairman of the membership committee. It was largely through his efforts in this capacity as well as his continued work in the same direction that the membership saw a greater increase than in any previous period.

Details of the specific contributions of each of the secretaries will appear at the appropriate place in the history as a whole.

That the Executive Council was appreciative of the work done by the secretaries and was willing to underwrite their needs is evidenced by the fact that on January 28, 1933

> "upon motion of Dr. Rhodes, the secretary was instructed to provide a steel filing cabinet for keeping the Academy records and the secretary was also authorized to have stationery printed." (Council Minutes, January 28, 1933.)

The activities of the Academy during the period under consideration (1932-1942), may be roughly grouped under four headings and will be so treated in presenting the history. These four groups are as follows:

1. Plans for increasing membership and revision of the Constitution to provide a legal basis for expansion.

2. Plans for affiliation with other scientific organizations, local, regional and national.
3. Plans for strengthening the teaching of science in Georgia and extending the influence of the Academy to the high schools of the state.
4. Plans for the publication of the proceedings of the Academy.

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1. *Plans for Increasing the Membership and Revision of the Constitution to Provide a Legal Basis for Expansion*

During the period of organization (1922-1932) the membership had been increased from twenty-six (26) to fifty-nine (59) and the qualifications for election to membership had remained essentially the same. In addition to nomination by an active member a prospective member was required to present a paper before the entire Academy before becoming eligible for election. At this time also, all members were required to present a paper before the Academy "at least once every three years," in order to rmain in good standing. Such restrictions as to membership were thought by some, as early as 1929, to prevent desirable growth of the Academy consequently a committee consisting of G. H. Boyd, Chairman, R. C. Rhodes, T. H. McHatton and W. S. Nelms was appointed on November 23, 1929 to study the entire matter of membership with special reference to qualifications for eligibility, classification after election and means for increasing the number of members.

Minutes of the meetings of this committee do not appear in the files of the Academy but apparently several meetings were held and the problems studied carefully. A committee report was made to the council on February 22, 1930 but apparently was not acceptable since the committee was instructed to continue their deliberations. A second report was brought before the council on January 10, 1931 but again was voted back for further study. The council did however, vote to increase the membership limit to seventy (70) in 1931 and in 1932 the limit was again raised to eighty (80), the qualifications for election to membership as well as the requirements for members to remain in good standing remaining the same.

That there was however, a definite feeling among members that the hitherto rather rigid regulations regarding requirements for members to remain in good standing should be relaxed is shown by the adoption of a motion in 1932

> "Motion made by Dr. L. P. Smith and passed that the regulation requiring members of the Academy to read papers at any stated frequency be abolished." (January 1932)

A motion was also passed at the same meeting instructing the president

> "to canvass the non-teaching element of the State for material for membership."

On February 22, 1930 it was recommended upon motion by R. P. Stephens and passed by the council that honorary members be defined as

"those who are active in research outside the State and who, by virtue of that work, have gained national distinction."

The membership committee (Boyd, Rhodes, McHatton and Nelms) was also instructed to create groups to which contributors to research might be eligible.

After three years of study (1930-1933) by the committee and much discussion among members the following recommendations regarding grouping of members were made to the Academy:

"*Members*: Residents of Georgia who are engaged in scientific work.

Fellows: The present regulations for members.

Honorary Members: Same as at present.

Patrons: Contributors of $100 or more to the funds of the Academy for research and other purposes."

The following provisions were included in the recommendations:

"That all business of the Academy be in the hands of of the Fellows.

That officers and members of the Council be in the hands of the Fellows.

That all authority be vested in the Fellows, who may refer special matters to the Academy as they desire.

That action of the membership or of special committees be considered as recommendations to the Fellows."

The above recommendations represented the first drastic changes made regarding membership and in reality marked the beginning of some of the most rapid growth and development of the Academy. The council responsible for the adoption of the changes as recommended and meeting at Memorial Hall, University of Georgia, on February 24, 1933, was composed of the following:

Pres. A. W. Scott
Sec. G. H. Boyd
A. S. Edwards
A. V. Henry
R. D. Kneale
Mary S. MacDougall
R. C. Rhodes
R. P. Stephens
G. C. White

The report of the council as stated above was made to the Academy at the annual meeting April, 1933, but after much discussion, at times quite heated, decision in the matter was postponed to be made the first order of business at the 12th annual meeting to be held in 1934. The Academy did vote however, to raise the limit of membership to eighty-five (85).

When the matter was presented in 1934 it was voted to table the recommendations pending a report of a special committee appointed to study revision of the constitution in order to provide for the reorganization of the membership grouping. The committee, consisting

of R. C. Rhodes, Chairman, G. H. Boyd, and A. V. Henry, was also instructed to provide for

> "a group of members who might be designated as members emeritus, such a group to include those who have been active members and who desire to keep their connection with the Academy."

The same committee was instructed also to

> "provide for the affiliation of certain scientific groups who now exist in the State."

At the annual meeting in 1934 ten new members were elected and the limit of membership increased to ninety-five (95). Since there had been so much discussion of the entire question of qualifications for members and since there seemed to be such lack of unanimity of opinion in the Academy as a whole, it was voted by the Academy (March 24, 1934) that the entire matter of membership be referred to the Executive Council with the power to act.

Records of the meetings of the Executive Council at which the matter was discussed do not appear in the files of minutes. However it seems that much study was given to the various problems involved and a final report was presented to the Academy as a whole at the annual meeting held April 3, 1936, at the University of Georgia. The following recommendations of the council regarding expansion and regrouping of membership were adopted:

> "Members: Residents of Georgia who are engaged in scientific work, or who are interested in the advancement of science.
>
> Fellows: Election to Fellowship in the Academy shall be a recognition of achievement. Therefore, membership in this group shall be limited to those who have been for at least five years successfully engaged in some line of recognized scientific work, or who have been for five years productive members of the scientific faculties of colleges of recognized standing, or to those who have made noteworthy contributions to science.
>
> Honorary Members: As at present.
>
> Patrons: Those who contribute $100.00 or more to funds of the Academy for research.
>
> All administration of the affairs of the Academy shall be in the hands of the Fellows: Officers and members of the Council shall be Fellows of the Academy. All authority shall be vested in the Fellows of the Academy, but particular problems may be referred by the Fellows to the Academy as a whole. Final decision in all matters shall be in the hands of the Fellows. Action of Members or of any committee of the Members shall be considered as recommendations to the Fellows." *Min. of 14th An. Meet. April* 3, 1936.

Seeking to implement the recommendations adopted as quickly as possible the Council meeting on November 21, 1936, voted

> "that the chairman appoint a committee to revise the con-

stitution and by-laws of the Academy to include the changes in membership voted at the last meeting."

President Stuckey appointed the following:

G. H. Boyd, Chairman
A. S. Edwards
D. F. Barrow

The committee made its report to the Council at a meeting held April 3, 1937 at Georgia Experiment Station, Griffin, Georgia. The report was approved by the Council for presentation to the Academy.

At the annual meeting of April 3, 1937 the recommendations as made by the Council were adopted and the constitution as revised and rewritten by the special committee named above which would give legality to the recommendations regarding membership was adopted. The secretary was immediately instructed by the Council to prepare a list of names of all those eligible for membership so that they might be invited to become members. Thus expansion was on the way.

The discussion of the drastic changes provided by the new constitution was extensive and somewhat heated. The provision for a group of Fellows in whose hands all business of the Academy was placed and by whom all matters proposed by members were to be considered as recommendations only was the subject of particular discussion and controversy. Perhaps looking back in retrospect one might consider the controversy as indicative of growing pains. It should be said however that several years were required to heal some of the breaches made.

It soon became apparent that since all business of the Academy was in the hands of the Fellows and since there were no Fellows and no provision for their election matters had come to a practical impasse. However, officers and councilmen had been elected at the meeting and were given power to act. In order to bring order out of chaos a special meeting of the new Council was called for June 12, 1937 at Agnes Scott College. Present at the meeting were the following:

Pres. J. L. Daniel	W. B. Baker	R. B. Holt
V-Pres. G. C. White	D. F. Barrow	J. H. Kite
Sec. G. H. Boyd	J. S. Guy	Paul Tabor

After much discussion of the various problems presented by the regrouping of membership a motion made by Dr. Guy and passed unanimously by the Council provided that:

"All persons who have at any time served the members of the Executive Council or as officers of the Academy are to be hereby declared elected as Fellows."

It was further voted that

"a committee composed of J. L. Daniel, G. C. White and J. S. Guy be appointed to formulate a letter to all members of the Academy stating the action of the Council in electing Fellows and explaining the present status of the Academy organization."

Such a letter was prepared and sent as ordered to the membership under date of November 23, 1937. The letter is quoted herewith in full:

TO THE MEMBERSHIP OF THE GEORGIA ACADEMY OF SCIENCE

The Georgia Academy of Science adopted a new constitution at its last annual meeting held in Griffin April 2 and 3, 1937. It was provided in the new constitution that the membership of the Academy be divided into two groups to be known respectively as "Fellows" and "Members." Any resident of Georgia engaged in scientific work or interested in the development of science is eligible for membership. For any eligible person to become a member it is necessary for him (or her) to pay the annual dues. From the members thus recruited the "Fellows" are to be elected. The government of the Academy will be vested in the Fellows and rsponsibility for its guidance and operation will rest on this smaller and less unwieldy group.

With the adoption of the new constitution it immediately became necessary to select a nucleus of Fellows to carry on the work of the Academy. After lengthy discussion of several plans the meeting voted to impose on the Executive Council the task of making this selection. Complying with this order the Council met at Agnes Scott College June 12, 1937. Several methods of selecting a governing group were presented and discussed in detail. It was finally suggested that the best plan possible would be to select for this duty those persons whom the Academy had itself, by its own vote, chosen for such work. It was therefore unanimously agreed to elect to Fellowship at this time all those persons who have at any time been elected by the Academy as Members of the Executive Council. This will include all past Presidents, Vice-Presidents and Secretaries of the organization.

The purpose of this communication is to convey to the entire membership of the Academy the action of its Executive Council on the question referred to it at the Griffin meeting. The Council voted to authorize the President and Secretary to call the newly elected Fellows together for an organization meeting. This will be done at the earliest possible time.

The Executive Council of the
Georgia Academy of Science.
G. H. Boyd, Sec.

The reactions to this letter were quite varied. Some members who had not been elected to an office or to the Council during their period of membership felt they were being discriminated against. Others felt that there should be no such group as "Fellows" set up but that membership should be opened to any resident of Georgia expressing an interest in science with no restrictions as to privilegs after becoming members. A third group felt that the establishment

of a group of Fellows in whose hands the business of the Academy was vested was a sound procedure and would insure the perpetuation of the high standards set by the original founding members. It was also felt that the opening of membership to all persons interested in science would enable the Academy to extend its influence and result especially in stimulating scientific effort in the secondary schools of the state.

It was obvious that the business of the Academy must be carried on in spite of the discussions which had arisen and that details of the organization as provided by the constitution of 1937 should be carried out. Accordingly a meeting of the Fellowship as set up was called for January 8, 1938 at the Georgia School of Technology. Those present were

Boggs	Fain	MacDougall	Slack
Boyd	Guy	Rhodes	Stephens
Daniel	Henry	Scott	
Edwards	Kite	Skiles	

President of the Academy, J. L. Daniel, was elected chairman of the group. By motion of Dr. Henry the officers and Council members elected by the Academy at the 1937 meeting were asked to continue in office for their respective terms.

The question of increasing the Fellowship was discussed at length and finally a motion made by Dr. Edwards and passed provided

> "that the Fellowship recommend to the Council that it is the sense of the Fellowship that a selective principle—perhaps that stated in the Constitution—be applied in selecting Fellows of the Academy."

The regulation referred to was as follows:

> "Election to Fellowship in the Academy shall be in recognition of achievement. Therefore, membership in this group shall be limited to those who have been for at least five years successfully engaged in some line of recognized scientific work, or who have been at least five years productive members of the scientific faculties of colleges of recognized standing, or to those who have made worthwhile contributions to scientific knowledge."—Art. II, Paragraph 3-2, Constitution of 1937.

The question of increasing the general membership was then discussed and a motion made by Dr. Guy provided

> "that Pres. Daniel appoint a committee consisting of the representatives of the various scientific organizations and institutions to furnish the Secretary with the names of those who should be invited to become members of the Academy."

After some discussion a substitute motion made by Dr. Rhodes and passed provided

> "that the full responsibility for determining who should become members of the Academy be placed upon the Secretary and the Executive Council."

It was hoped that the actions taken at this meeting would prove

satisfactory to the membership at large and that frictions developed would be relieved. Such was not the case however, since at the Council meeting of April 1, 1938 a motion was made

> "that the Council recommend to the Fellows that the membership be asked to indicate whether the Fellowship group of the Academy should be abolished or should be made to include the entire present membership of the Academy."

A substitute motion was made that the Council recommend to the Fellows that all of the present membership (as of 1937) be elected to Fellowship.

A further substitute motion was made and passed providing

> "that the President appoint a committee from the Council to draft a plan for election of Fellows and lay this plan before the Fellows in a meeting following the dinner."

In accordance with this motion the following committee was appointed:

H. P. Stuckey, Chairman
G. H. Boyd
J. L. Daniel
J. S. Guy
J. H. Kite

No evidence is found in the minutes that this committee recommended any essential changes in the method of electing Fellows of members other than provided by the constitution. However. between the time the new grouping of membership was set up and the problems involved were solved there were some letters of protest, regarding the changes made, sent to the Council accompanied by statements of resignation from the Academy.

That there were other objections to the new plan as provided by the constitution adopted in 1937 is evidenced by the fact that in 1939 two nominees for the Council made in the annual election were found to be ineligible since they were not Fellows, and had to be replaced by the Council by two individuals who were Fellows. At the same Council meeting (May 5, 1939) three motions were made and passed which indicated that the Council members were endeavoring to solve the problems of membership to the mutual satisfaction of all concerned. The motions were

I. "that the Secretary be instructed (in reckoning eligibility to Fellowship in the Academy) to consider a paper read by a member of the Academy to a regional scientific group meeting with the Academy as having been read before the Academy itself."

II. "that the President appoint a committee to bring in recommendations as to methods of increasing membership, procedure to be followed in electing persons to membership, and the necessary amendments to the Constitution for providing such mechanisms."

III. "that the nomination of Fellows be referred to this committee."

Fourteen (14) new members were elected at the same meeting, bringing the total membership as of 1940 to 122. It should be noted that this number was reduced to 116 in 1941 but increased to 133 during 1942 as reported by Secretary Edwards at the Council meeting on January 5, 1943.

At the annual meeting held April 4 and 5, 1941 considerable emphasis was given to discussion of the problems of membership and all members were encouraged to make an effort to recruit new members from any persons they might know who were interested in science. Particular emphasis was given to the desirability of securing as members, as many of the science teachers in the secondary schools as possible. In addition the qualifications for Fellowship were reviewed and requests were made for nominations to this group. That the campaign for new members met with increasing success is indicated by the fact that a total of 190 members were named in the Bulletin published in July, 1943. Of these 34 were Fellows. In the Bulletin for April, 1946 a total of 225 members were listed of whom 57 were Fellows.

Considering the fact that the years between 1940 and 1946 were trying ones due to the war activity it seems one might conclude that the Georgia Academy had shown considerable growth in numbers as well as in strength and influence. More of the details of this critical period will be outlined in a subsequent chapter of the Academy history.

NOTE: Space does not permit the publication of the complete installment of the second period of the history of the Academy, hence the details of the remaining topics as listed in the beginning of the present installment will appear in an early issue of the Bulletin.

W. B. BAKER, *Historian*
June, 1955

SEEDLING CHARACTERISTICS OF CONIFERS OF SOUTHEASTERN UNITED STATES

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Conifers are important both in numbers and in commercial values in Southeastern United States and their distinctive seedlings merit some attention. Seedlings of many conifers have the unusual feature that they are radically different in appearance from the adult plants. As a result, anyone who is concerned with conifer seedlings will have to know how to identify or classify the seedlings with their adult forms, as well as to distinguish seedlings of different kinds of conifers from each other. Seedlings of conifers, or of most plants for that matter, have fewer differences than those between adult plants, so that in many cases seedlings of closely related species

probably could not be separated even by an expert. Conifer seedlings can, however, be identified as to genus, and this paper will describe the significant characteristics of each genus found within Southeastern United States.

Before considering the individual genera of conifers, let us indicate briefly how conifer seedlings differ from other kinds of seedlings. Conifers are sometimes called polycotyledenous to differentiate them from the invariably one or two cotyledonary condition of the angiosperms. Thus, many conifers have more than two cotyledons and in this way they are distinct. We have not disposed of the problem completely however, because many conifers, including several in Southeastern United States, have two cotyledons. Dicotyledonous conifer seedlings can be distinguished from the so-called "dicots" by their prevailingly linear leaves which have single (or rarely parallel) vascular bundles and not the net-veined condition of the "dicots."

Four families and ten genera of conifers are found in the area under discussion. Pinaceae is the most prominent family with four genera; three of which, however, are found only in the Appalachian Mountain area. Next in importance is the family Cupressaceae with three genera. Taxodiaceae is represented by one genus *Taxodium,* while two genera of the family Taxaceae are found as very rare plants. In addition, there are commonly cultivated representatives of the first three mentioned families which do not belong to any genus occurring naturally in this area.

The most common conifer of the southeast is pine, or the genus *Pinus,* including a number of species, perhaps as many as ten. Leaves of pine seedlings are not grouped into bundles of needles at all as they are on adult plants, in fact they are not really needles. These leaves are linear, flat and taper gradually to a point. Pine seedlings can readily be distinguished from those of other related genera by observation of several characteristics. First their leaves are broadly attached to the stem and decurrent—that is to say the leaves appear to continue down the stem without interruption—while those of similar genera have different kinds of leaf bases. Second, leaves of pine seedlings bear fine teeth that can be seen or felt by close observation. Finally pine seedlings have fairly long leaves, generally being well over half an inch in length.

Other genera of Pinaceae (which are restricted to the Appalachian Mountain area) have seedlings whose leaves resemble the mature leaves in a general way. Those of spruce (or *Picea*) have finely toothed needle-like leaves that are short (¼-½ inch), narrow, and sharply pointed with typical spruce leaf-bases; that is, the leaf-base is narrowed into a short stalk and is then decurrent and thickened into what is called a pulvinus. Leaves of hemlock (or *Tsuga*) seedlings have similar leaf-bases to those for spruce and in addition may have a few fine teeth at the tips. They differ from spruce, however, in being blunt and relatively broad compared to their thickness, while hemlock also differ from spruce by having only two to four cotyledons. Fir, very restricted as far as Southeastern United States is concerned, has smooth linear leaves with a short stalk which widens

out into a shield-like attachment to the smooth stem. Deodar cedar (genus *Cedrus*) is commonly cultivated in the southeast. Cedar seedlings resemble those of spruce but their leaves differ in being long (about an inch) and not toothed.

The southern cypress (genus *Taxodium*) is the only local representative of the family Taxodiaceae. Like the genera of Pinaceae described above, cypress seedlings have several cotyledons, generally six. They differ from most conifers in growing quite rapidly so that their small leaves are scattered along the smooth stem with large internodal spaces. The cotyledons are several times as long as are the leaves, a distinction from the forms described above with similar numbers of cotyledons. Although some varieties of cypress have more or less scale-leaves when mature, the seedlings are always the same, bearing linear leaves up to half an inch long with a slight constriction at the base where they are attached to the stem.

Two members of the Taxodiaceae are commonly cultivated in the southeast, *Cryptomeria* from Japan and *Cunninghamia* from China. *Cryptomeria* seedlings have three broad and blunt cotyledons followed by narrow linear leaves, not unlike those of *Taxodium*, but longer and more closely spaced, soon becoming needle-like until eventually the short thick mature needles are formed. *Cunninghamia* seedlings have two cotyledons but otherwise resemble pine seedlings in general appearance including the presence of minute teeth. The seedling leaves become nearly an inch long and have the same general appearance as the somewhat larger leaves of mature plants. Seedling *Cunninghamia* leaves differ from pine in being somewhat broader and flatter, especially on the underside where the vascular bundle on leaves of pine seedlings is marked by a sharp keel. In addition, leaves of *Cunninghamia* seedlings have a strong tendency to curve laterally in a falcate fashion, while those of pine are straight.

Common in Southeastern United States is the juniper (genus *Juniperus*) which frequently goes by the name of cedar. Like other members of the family Cupressaceae, juniper seedlings have two cotyledons followed by two opposite decussate leaves and then by alternating whorls of leaves, usually four to a whorl. Unlike the scale-leaves of adult junipers of the southeast, the seedlings have linear leaves which are stiff, sharp pointed, and strongly keeled on the underside. Leaves in whorls are a unique characteristic of seedlings in Cupressaceae and the stiff pointed character singles out *Juniperus*, while the general length of about half an inch and the narrowly linear and decurrent leaves are characters of practically all seedlings of the various genera in Cupressaceae.

The eastern white cedar, of the genus *Chamaecyparis*, has seedlings similar to those of *Juniperus* but its leaves are not stiff and pointed. Rows of stomates are likely to appear as prominent white bands on leaf undersides. The genus *Thuja* is found only to a limited extent in the southeast in parts of the Appalachian Mountains. Seedlings of *Thuja* also resemble those of *Juniperus* but even more they resemble those of *Chamaecyparis*. In general they tend to be flat and without prominant white bands on the undersides. The

first lateral branches occurring soon on the seedling have the peculiar flattened form with scale leaves similar to the adult foliage by which these seedlings can be distinguished readily from those of any other genus.

Frequently cultivated in the southeast are two members of Cupressaceae not native to the area. Aborvitae (genus *Biota* not *Thuja*) from China has fairly typical seedlings of the Cupressaceae type. It is characterized by larger cotyledons than for most members of this group, they being well over a half inch long and spatula shaped. Seedling leaves are likely to be vigorous and do not show prominant bands of stomates. Like the genus *Thuja*, positive identification of *Biota* seedlings must wait the production of lateral branches. These are flattened and bear scale leaves in the same manner as *Thuja*, but do not have the differentiation into dorsal and ventral sides as is true in the latter genus. Arizona cypress of the genus *Cupressus*, unlike other related genera, has more than two cotyledons, three to five being produced. In other ways the seedlings resemble those of the family under discussion, notably by having leaves placed in alternating whorls, usually of four each. The leaves change very slowly into the adult scale-form.

The remaining conifers of the Southeast belong to the family Taxaceae and are quite rare, being found mainly in western Florida. The Florida yew (genus *Taxus*) has two cotyledons which are over an inch long, much larger than the dicots of the family Cupressaceae. Leaves following the cotyledons are generally placed in opposite alternating pairs for a time or two after which a spiral placement is seen. Leaves frequently have the falcate curvature discussed for *Cunninghamia* but differ in a number of ways from those of this genus. The leaves are smooth, loosely placed and have a constriction at the base which does not continue into the decurrent part of the leaf. Seedling leaves of *Taxus* resemble those of the adult plants closely. The most distinctive conifer seedlings of the southeast belong to the stinking cedar (genus *Torreya* not *Tumion*). The seed of *Torreya* is large and the two cotyledons stay underground in the seed when the plant germinates. The fleshy stalk which comes up at first bears incompletely formed scale-like leaves, but eventually the normal leaves are found. Leaves of *Torreya* resemble those of *Taxus*, but differ in their placement in opposite pairs, usually forming six ranks of leaves.

Other conifers than those discussed above are grown in Southeastern United States but are not frequently encountered. The most common of these are the California incense cedar (genus *Libocedrus*) and members of the genus *Podocarpus*.

The identification of conifer seedlings is an interesting problem because of the frequent large differences between seedling and adult leaves. In most cases seedling conifers can readily be placed into the proper genus by inspection, especially when the identifyer has seen that kind of seedling before. With the help of the above descriptions one should be able to identify the conifer seedlings likely to be encountered in Southeastern United States.

KEY TO CONIFER SEEDLINGS OF SOUTHEASTERN UNITED STATES

A. One to two cotyledons, when two the following leaves net-veined or lobed (ginkgoaceae, cycadaceae): seed plants other than conifers.

A. Two or more cotyledons, leaves with single (or rarely parallel) vascular bundles and not lobed: conifers.

B. More than two cotyledons.

C. Leaves not stalked.

D. Bearing fine teeth. *Pinus*

D. Not toothed.

E. Leaves spirally placed.

F. About six cotyledons, leaves with large internodal spaces. *Taxodium*

F. Three cotyledons, leaves closely spaced. *Cryptomeria**

E. Leaves in whorls of three or four. *Cupressus**

C. Leaves stalked.

G. Leaves attached to a raised area (pulvinus) on the stem.

H. Needle shaped leaves, pointed.

I. Toothed. *Picea*

I. Not toothed *Cedrus**

H. Leaves linear (flat), blunt. *Tsuga*

G. Leaves attached by a shield like extension at their bases on a smooth stem. *Abies*

B. Two cotyledons.

J. Leaves in whorls, becoming opposite.

K. Stiff, pointed, and strongly keeled on the underside. *Juniperus*

K. Not stiff, pointed, or strongly keeled.

L. With two prominent white bands of stomates on the underside. *Chamaecyparis*

M. First lateral branches flattened and dorsi-ventrally differentiated. *Thuja*

M. First lateral branches sometimes flattened but not dorsi-ventraly differentiated. *Biota**

J. Leaves spirally placed or temporarily opposite.

N. Leaves not stalked. *Cunninghamia**

N. Leaves stalked.

O. Leaves short, blunt, and with a few fine teeth at the tips (occasionally with two cotyledons). *Tsuga*

O. Leaves longer, pointed and not toothed (usually with two cotyledons).

P. Cotyledons underground, first leaves reduced. *Torreya*

P. Cotyledons above ground, first leaves normal. *Taxus*

*cultivated

FOR THE CHARACTERISTICS OF CONIFER LEAVES SEE:

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XENOLITHS IN GRANODIORITES OF THE EAST GEORGIA PIEDMONT

ELDON J. PARIZEK

INTRODUCTION

Foreign inclusions known as xenoliths locally contaminate the granitic rocks of the east Georgia Piedmont. Most often they are relics of partially assimilated schists and more massive pelitic rocks which were located in the zone of metamorphism surrounding intrusive granodiorities. Although several varieties of inclusions may occur, only two types, (1) schist xenoliths, and (2) hornfels xenoliths, are numerically significant. This paper describes the composition and lithologic aspect of the inclusions which appear most frequently, particularly those occurring in granodiorite exposures in Clarke County, Georgia.

SCHIST XENOLITHS

Rectangular schist xenoliths, ranging up to several feet in length though less than two feet wide, occur in the zones bordering intrusive granodiorite gneiss and schist. Introduced materials have modified many xenolith fragments to the extent that original shapes either disappeared entirely or are practically indistinguishable from the gneissic host rock. The schistose ground mass has been disjoined parallel with the foliae by straight and swirled bands of light-colored granitic material, while lateral margins of the fragments are edged by tangent zones of concentrated biotite. The biotite content is visibly reduced in those xenoliths effectively pervaded by magma, and conversely, the adjacent gneiss is dominated by stringers, shreds and fragments of micaceous material (Figure 1).

Banding of the inclusions conforms with the flow pattern of the gneiss, and only a few of the schist xenoliths are non-conformable. The half-inch wide leucocratic layers are commonly thicker than the melanocratic layers and often grade directly into the gneiss. The inclusions which have not been totally absorbed in the gneiss all show evidence of at least incipient reaction because of ragged terminations.

Quartz, myrmekite, oligoclase, biotite, muscovite, epidote and iron oxides comprise the mineralogy of granitic layers, while the schistose bands are composed of quartz, coarse flaky biotite, muscovite, feldspar, traces of cordierite, and almandite garnet. Plagioclase is disseminated as porphyroblasts throughout the inclusions, with no clear concentration in either the dark or light bands. The parallelism of biotite in both fractions and its addition from dark bands into the granitic layers strongly suggests that the alternating structure has resulted from forceful penetration rather than metamorphic differentiation.

Doubtless, the schist xenoliths formerly outnumbered other varieties of inclusions taken into the magma, but their facility for in-

corporation or breakdown caused many to be obliterated. However, their former existence is indicated by the excessively biotitic and otherwise contaminated appearance of the granodiorite. For example, more than two hundred sharply outlined inclusions occur in a highly biotitic granodiorite exposure along the North Oconee River in Athens, Georgia (Figure 2). At this locality, the great majority of inclusions are hornfels xenoliths, reflecting but slight evidence of assimilative reaction with the original melt. Nevertheless, the entire exposure is extremely gneissic, with flow lines marked by prolific amounts of coarse flaky biotite which was added by thorough assimilative reaction with schistose xenoliths.

HORNFELS XENOLITHS

Blocky, rectangular hornfels xenoliths, whose fine uniform texture contrasts distinctly with the enclosing gneiss, are other common inclusions occurring in the granodiorities. Although the hornfels xenoliths are usually less than three feet in length, their long dimensions are consistently aligned with flow patterns of the gneiss (Figure 3).

Hornfels xenoliths are non-foliated dark-gray rocks, infrequently penetrated by granitic materials. The small and equidimensional grains of the dense hornfels contrast in color, which produces a salt and pepper appearance. Apparently the inclusions were derived

FIG. 1. *A partially assimilated schistose xenolith in granodiorite along the North Oconee River, Athens, Georgia. The pencil parallels swirled biotite foliae and pervasive granodiorite. Margins of the xenolith are gradational into the enclosing gneiss.*

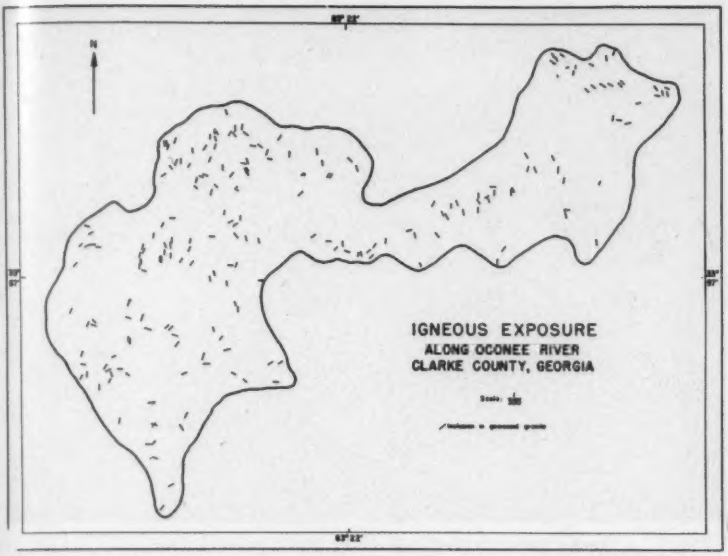

FIG. 2. *A generalized outline map of exposed granodiorite below the Oconee Elementary School, Athens, Georgia, illustrating the patterns of major axes of hornfels xenoliths. The granodiorite flow lines, manifested by biotite from absorbed schist xenoliths, are not shown but are in harmony with the alignment of the hornfels inclusions.*

from seldom exposed thin hornfels layers that are structurally concordant with other phases of country rock in some parts of the eastern Piedmont. Subsequent to or coincident with granitic intrusion, the massive hornfels withstood the intricate foliation acquired by the adjacent schists, and the stresses were relieved along shear and fracture planes. Consequently, when hornfels were enveloped by invading melt, they entered as non-foliated blocks.

It is possible that some hornfels inclusions may be remnants of a rapidly cooled peripheral facies of the granodiorite, but in Clarke County such early melanocratic rocks have not been identified. If such rocks exist elsewhere in east Georgia, however, it may be difficult to establish their magmatic origin, for metamorphism may remake xenoliths to resemble cognate fragments so closely, or vice versa, that the chemical signs of parentage have been lost. Grout (1937) has stated, "there is nothing in the igneous character of an analysis of an inclusion to warrant the assumption of igneous origin. Probably half the inclusions in granites and granodiorities are sediments so far altered as to be identified with difficulty."

The few light bands in hornfels xenoliths are texturally and compositionally similar to the coarse granodiorite host, and, therefore, contrast sharply with the fine-grained hornfels bands. The straight

FIG. 3. *A blocky hornfels xenolith below the Oconee Elementary School, Athens, Georgia. The hammer parallels the long direction of the fragment and the granodiorite lineation. Boundaries between hornfels xenoliths and granodiorite are emphasized by the contrast in texture. The inch wide leucocratic bands are texturally coarse-grained granodiorite.*

and uniformly wide granitic bands which parallel the long dimension of the inclusion are one-half to one inch wide. In some inclusions granodiorite connects parallel bands, probably filling former shear fractures in the fragment. The xenoliths are bordered by a zone of fine-grained biotite, which exists irrespective of the presence or absence of ragged terminations.

Thin sections of the hornfels fraction reveal that the mica is red-brown biotite, averaging between 0.7 mm to 1 mm in diameter and occurring in decussate aggregates with the flakes oriented in random to crisscrossing patterns. Also significant is cordierite in pseudo-hexagonal crystals with short prismatic habit that are marginally altered to yellow chlorite. Other minerals include porphyroblastic plagioclase and garnet, and traces of epidote, ilmenite, magnetite and apatite.

All the inclusions of figure 2 are hornfels, with the long axes of more than sixty per cent striking nearly north-south and manifesting a strong preferred orientation. In the same exposure small groups of xenoliths are oriented in circular trends comformable with circuitous flow structures in the gneiss; their arrangement probably reflects minor eddy movements in the melt at the time of consolidation.

SUMMARY

Swarms of inclusions occur locally in granodiorite exposures of eastern Georgia. Although several varieties are known to exist, only two, schist xenoliths and hornfels xenoliths, are abundant. The mineralogy of both suggests that the inclusions are remnants of country rock situated in the metamorphosed aureoles of intrusive masses. Concordance between the long dimensions of the inclusions and the flow patterns of the granodiorities indicates a preferred orientation obtained when the enclosing gneiss was in a fluidal condition.

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A STUDY OF UPPER CRETACEOUS DEPOSITS EXPOSED AT THIELE KAOLIN COMPANY PITS EIGHT MILES WEST OF SANDERSVILLE, GEORGIA

THOMAS H. GUTTERY and JOHN A. ALBRITTON

INTRODUCTION

We would like to express our gratitude to Mr. O. E. Etheridge of the Thiele Kaolin Company, who gave permission to visit the site, and assisted in the field work for this paper. The investigation was undertaken with a desire to determine as much of the paleogeography of the sediments as possible; the area discussed is the Thiele Company pits located eight miles west of Sandersville, Georgia, via the Deepstep highway on the east side of Buffalo creek and on the Hall and Wood properties. This site lies a short distance from the Fall Line which is shown on the location diagram (Fig. 1).

Field work describes the exposures which were sampled systematically. Thickness of the units were estimated. In the laboratory statistical size and sorting analyses and heavy mineral counts were made on the sand unit separating the two kaolin lenses.

DESCRIPTION OF THE SEDIMENTS

The sediments are all of Upper Cretaceous (?) age. They consist of two lenses of kaolin separated by a ten-foot layer of sand.

Several filled stream channels are in the area. They were cut before or after (never contemporaneous with) the deposition of the kaolin. They are filled with sand and abundant organic remains: wood (Fig. 2), bark, needles, cones of pine trees, well-preserved leaves (Fig. 3), various types of unidentified wood and twigs ranging from chips to tree trunks, all slightly too highly carbonized, and also a wide variety of unidentified material which probably includes

FIG. 1. *Location of area.*

nuts, acorns, etc. A cocoon-like object composed of rolled-up leaves is believed to represent the pupal stage of an insect.

The sand unit between the two kaolin lenses is current-bedded and composed predominantly of quartz (Fig. 4). It is contaminated by about 10% clay which was washed out before statistical analysis.

The kaolin lenses are both very homogeneous in themselves. However, there is a significant difference between the two units. Impurities are chiefly quartz, mica, tourmaline, and oxides of titanium.

Marcasite, usually in concretionary form. is relatively common. Although it does not directly apply to the topic under consideration, it is worth noting because it may be of economic importance if a sufficient amount is uncovered. This marcasite alters to a limonite and a melanterite-like coating, and contains some hematite at the contact between the marcasite and the coating. This is an excellent location for the formation of marcasite because a highly acidic solution must be present for its formation.

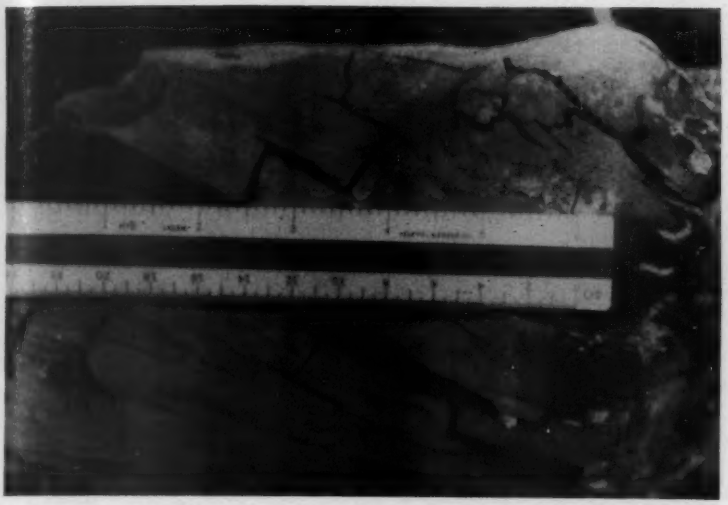

FIG. 2. *Piece of preserved wood found in filled stream channel.*

SEDIMENTARY ANALYSIS

Sedimentary analyses were run on the sand unit separating the kaolin lenses in order to reach conclusions regarding transportation and the geologic provenance. Ten samples were taken at one-foot intervals from top to bottom.

Size and Sorting: Ten two-hundred gram samples were ro-tapped to determine grain size and sorting of the sediment. It was necessary to wash these samples before sieving them. The kaolin had such coherent strength that individual particles would not separate by ro-tapping, thus giving false results if not washed.

Results of grain-size determination in the ten samples indicate no significant difference from top to bottom in the sand bed. The average of the results is shown in figure 5. The mean grain-size was caught on the sixty-mesh (.250 mm.) sieve.

The sand-size particles are well-sorted. Material below two-hundred and thirty mesh (.062 mm.) which shows a sharp increase above that to be expected, should be made up largely of material which

FIG. 3. *Quercusphyllum* (?). *Leaf found in organic remains.*

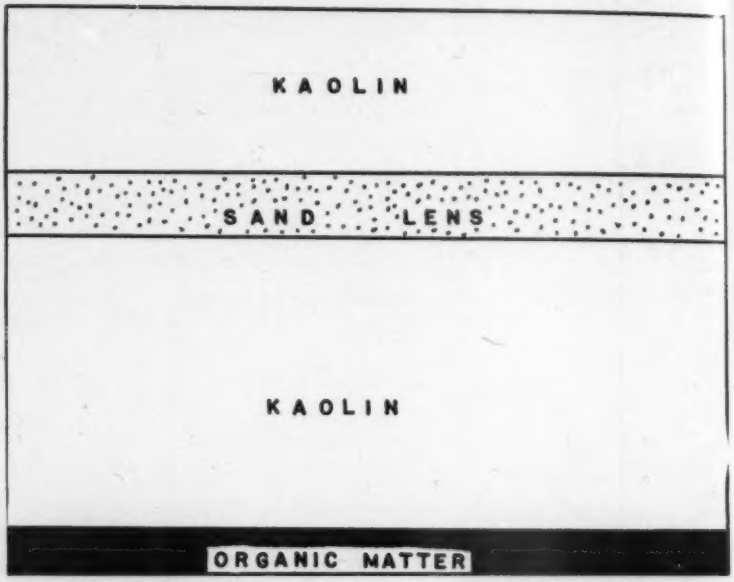

FIG. 4. *Diagrammatic sketch showing relation of beds.*

was introduced after the deposition of the sand. Kaolin probably infiltrated into the sand, thus accounting for these impurities.

Shape: Shape of the grains was determined by use of a Seeoscope. Grain outlines of all ten samples were traced and were found to have a characteristic shape of angular to sub-angular.

Heavy Minerals: The sands contain, on the average, slightly more than 1% heavy minerals. Of the ten separations made, the percentage of heavy minerals ranges from one-half to two percent. These are in order of abundance: opaque minerals (probably mostly iron oxides), zircon, staurolite, rutile, tourmaline, and leucoxene.

CONCLUSIONS

The lenses of kaolin are thought to represent old lake bottoms. These two lakes possibly represent two separate environments of deposition, rather than two different stages of deposition in the same lake. The duplications of environment may be due to movement in the vicinity of the Fall Line. This movement possibly controlled the environment throughout deposition of the entire sequence of sediments studied.

Composition of the sediments would indicate that the geologic

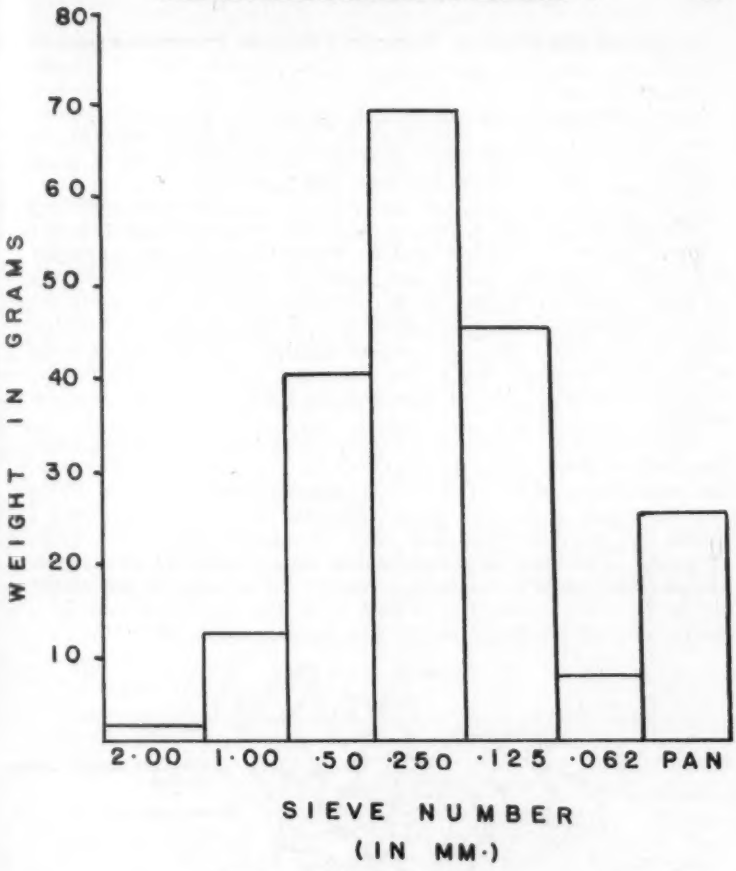

FIG. 5. *Histogram of sand lens.*

provenance was probably composed of acid metamorphic rocks or a combination of acid metamorphic and acid igneous rocks, and the shape of the sand grains indicates a short distance of transportation. We conclude that most of the material came from biotite gneiss and schist and porphyritic granite gneiss lying only a short distance north of the area under investigation. Minor amounts may have come from porphyritic granite and the Little River Series which is also not too far-distant from the source area of the sediments.

VARIATIONS IN THE CHEMICAL CHARACTER OF SMALL STREAMS

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Because it has been necessary to study streams which can be developed for water supply and/or waste disposal, the concepts of variations in water quality are generally dependent on the study of large streams. During severe drought, however, the need arises for an understanding of the drainage pattern of small streams. Because of this need, the U. S. Geological Survey has instituted a study of the headwaters of the Yellow River Basin, and has permitted us to study with them the variations in the water quality of these small streams.

Figure 1 shows a map of Georgia, along with a detailed map of the Yellow River Area, as provided by the Geological Survey. In the preliminary phase of the study samples from 27 points throughout the study area were taken. Because of the time required for travel and analyses, two days were required to cover this number of points. The most intensive studies were limited to two adjacent sampling points in the northeast corner of the basin at the southern tip of the areas outlined by dotted lines. The smaller stream in this study had a drainage area of 3.84 square miles, while the larger

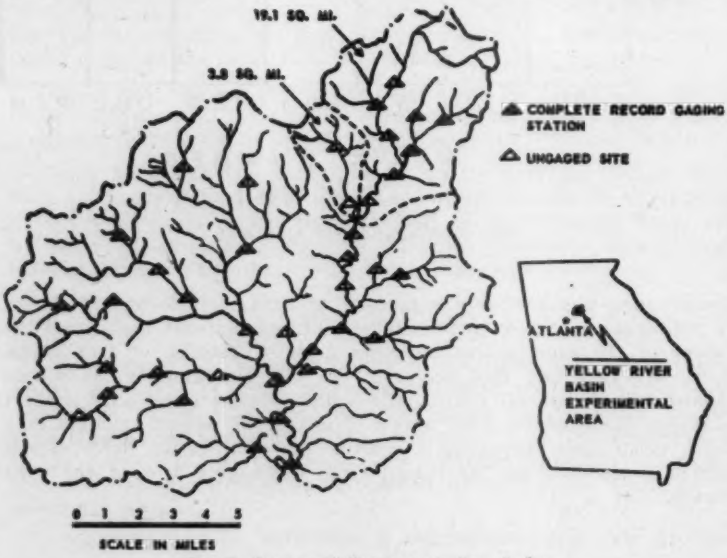

FIG. 1 *A map of the area under study.*

stream had a drainage area of 19.1 square miles. These two points were chosen because of the convenience of getting back and forth from one point to the other by truck and obtaining samples from the two points alternately for several hours. In spite of the difference in the drainage areas, the flows on most days of the study were of the same order of magnitude. In fact, the flow from the larger area was much smaller than the arithmetic sum of the individual flows of tributary streams in the larger drainage area, or as it has been occasionally found by the Geological Survey, the "whole" is less than the sum of its parts!

In the early portion of the joint study, a hydraulic engineer measured the rate of discharge while we obtained and analyzed the samples. All dissolved oxygen (D.O.) values were determined within minutes of drawing the sample. The biochemical oxygen demand (B.O.D.) values were obtained by determining the D.O. remaining in a replicate of the D.O. bottle after five days storage. The B.O.D. values indicate roughly the food available for heterotrophic organisms.

TABLE 1

Average value for 5 gauging or sampling points in the Yellow River area. (These averages are typical of averages of the other samples taken that day but not sampled three times.)

Date	Temp. °C	(ppm)	D.O. Saturation percent	B.O.D. (ppm)	(liters / min.)	B.O.D. (grams / min.)
10-12- & 11-5-1953	13	8.8	83	1.3	5,680	7.4
11-12*- & 11-19-1953	11.5	10.3	91	1.9	6,350	12.1
5-19-1954	18	8.6	90	1.0	12,200	12.2

* A light rain occurred on November 8, 1953

The data of table 1 show information obtained from five points scattered throughout the area of the map. The specimens were among 27 samples taken during three sampling periods. Inspection of the data from all of the points analyzed shows an amazing uniformity of water conditions in the streams during any one day, and on different days within the same weather period. The samples of October 12, and November 5 were very similar in chemical quality because no rain had fallen. When the same stations were sampled again on November 12 and November 19, the results of the 12th and 19th were very similar to each other but very different from the results of the earlier period, before the rain. In May of the next year, the data from some of the same points showed interesting differences and similarities. The differences in the total B.O.D. values for the low-flow conditions were so great that some explanation was needed. It was concluded that the longer the water stays in the ground (between the time of the rain and the arrival in the river) the lower the B.O.D. becomes by biological self-purification. This hypothesis is based on the concept that the organic matter is in the surface of the ground as a decomposing leaf cover and that the water

dissolves the organic matter in passing through the organic layer. When the water remains underground because of the time required to flow through the soil to the river, the organic matter content decreases by biological action: when it rains, the water reaching the river comes from a point nearer the river and thus has a higher B.O.D.

Other groups have arrived at similar conclusions; thus the Coweta Experimental Forest indicated in a private communication, that they had data which show that the chemical quality of water varies with the time following a rainstorm. This chemical variation does not involve the variations from surface drainage where the variations are obvious. The variations in the chemical quality of the forest streams following a storm take place over a period of 2 or 3 days because of the "age" of the water (time between precipitation and entry into the river from the ground). Thus, the tannic acid in solution from the leaf cover causes a sharp drop in pH of the small forest stream as the "new" water following a storm enters the stream: with time, the pH values rise from 5.5 to the normal of 7.0 as the age of the water increases.

The results of this study are shown in the figures which indicate a wide fluctuation in water quality.

On August 6, as shown in figure 2, it was found that the flow from the larger area (point No. 39) was smaller than the flow for the smaller area. The D.O. and B.O.D. values were similar, though there was considerable variation in the minimum and maximum B.O.D. values in the 4-hour period studied.

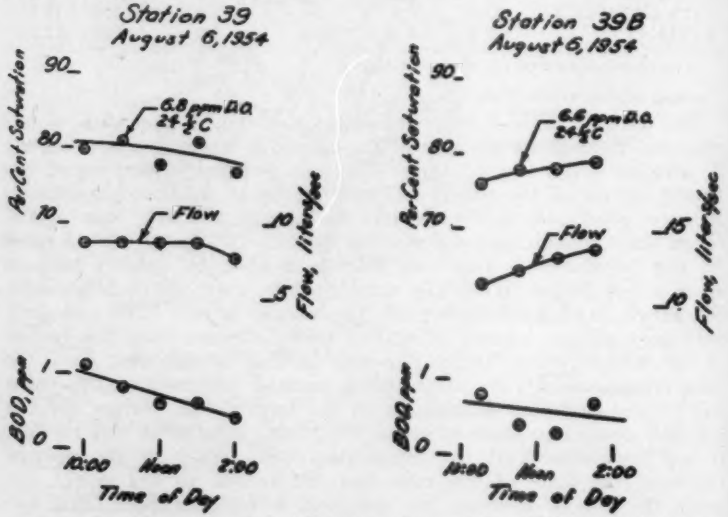

FIG. 2. *Data for August 6, 1954, on water quality at different times of the day.*

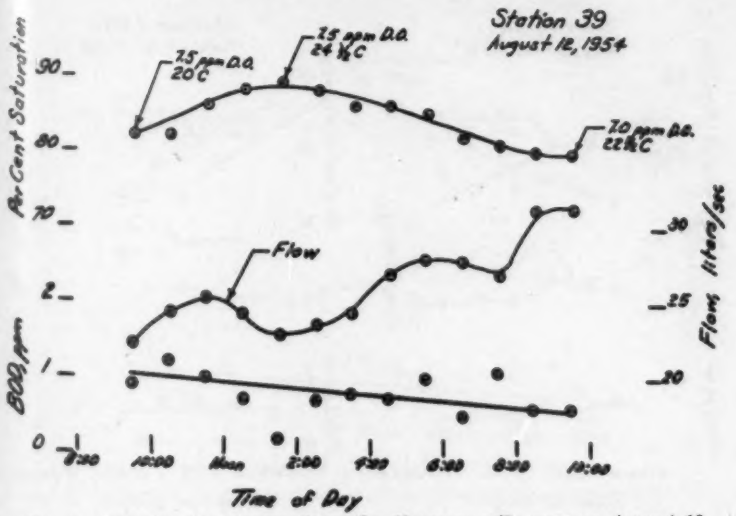

FIG. 3. *Data for the stream from the 19-square-mile area on August* 12.

The sampling of August 6 was interrupted by a shower. This is still reflected in the flows of August 12, when it was found that the stream from the larger drainage area had a much larger flow than that from the smaller drainage area, as seen by figures 3 and 4. The

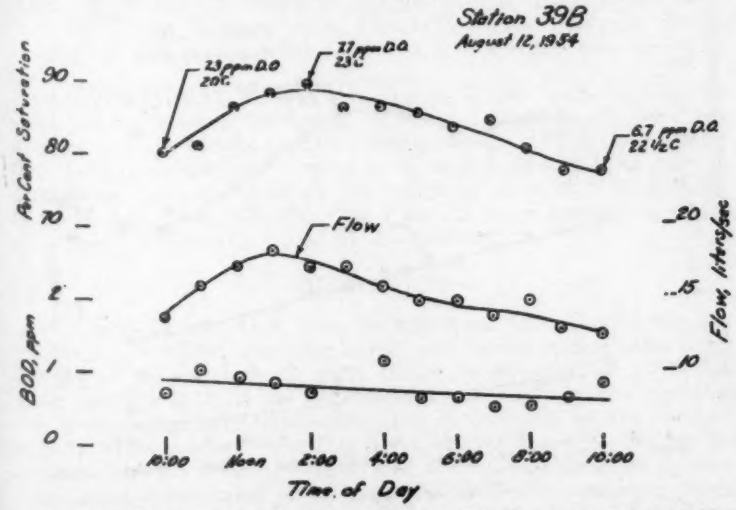

FIG. 4. *Data for the stream from the 3.8-square-mile area on August* 12.

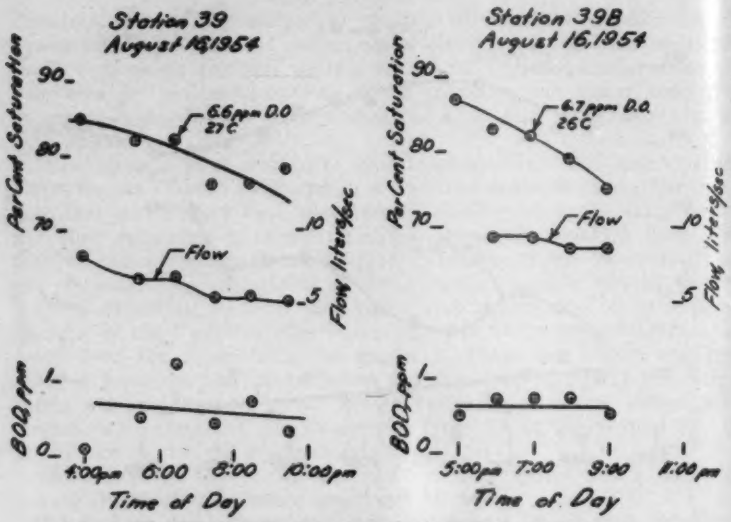

FIG. 5. *Data for the August 16 sampling period.*

B.O.D. values varied widely, with a generally downward trend in both streams. The D.O. values rose to a maximum and then fell off as though they were following the sunlight intensity in both streams. The flow in the large stream varied in an unexplained

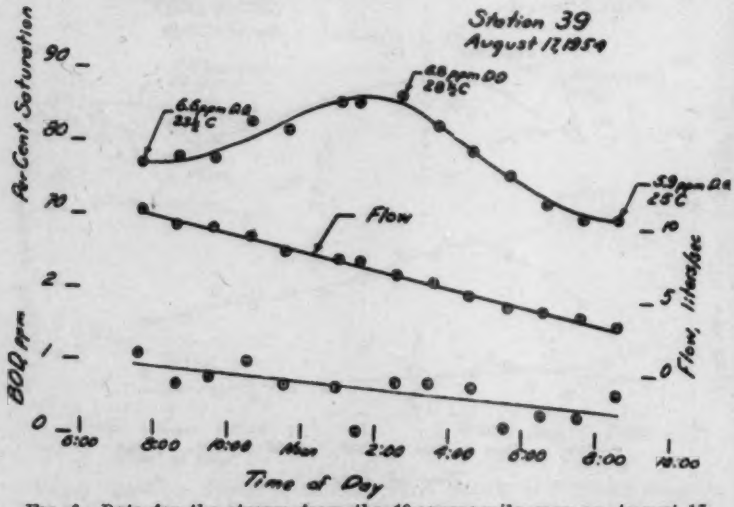

FIG. 6. *Data for the stream from the 19-square-mile area on August 17.*

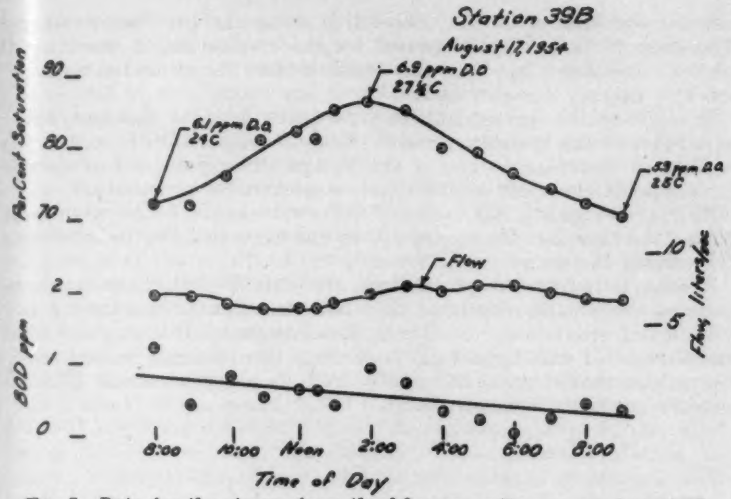

FIG. 7. *Data for the stream from the 3.8-square-mile area on August 17.*

pattern as though there were a local storm on the larger shed, but the smaller drainage area discharged a maximum flow near the peak sunlight when the transpiration might be expected to be at a peak.

On August 16, as shown in figure 5, the flow of both streams had fallen off to the low values of August 6, with slightly less water from the larger drainage area. The D.O. values were low during evening and fell rapidly after dark. The B.O.D. values were generally low.

During August 17, as shown in figures 6 and 7, the flow in the large stream reached its lowest value, and there was a very low average value from the smaller drainage area. In both streams the D.O. hit a peak saturation value at or near 2:00 P.M. The drop in D.O. value from the peak to the minimum at 8:30 P.M. is large in relation to the B.O.D. The flow from the large drainage area fell off steadily during the period of observation.

DISCUSSION

The large drop in D.O. from its maximum value during the day cannot be correlated with the B.O.D. and indicates that some other factor for the low D.O. at night should be investigated. Does this mean that the D.O. of the underground water is very low and that the groundwater contributes this low D.O. value to the stream? Shortly after a storm, the B.O.D. values for many points on the watershed were definitely higher than the values shown for summer days. An average value of 1.9 ppm. B.O.D. for 15 sampling points 2 days after a storm indicates that the groundwater contributes

varying amounts of B.O.D., depending upon the previous weather. The drop in D.O. may be caused by the respiration of sessal (attached) organisms, but it is also possible that the groundwater contributes varying amounts of D.O.

It would not be unreasonable to expect that the other chemical characteristics of the streamwater will change over a 24-hour period. It is planned therefore, in one of the Yellow River points, to measure by a 4-point electrical recorder pH, conductivity, temperature, and turbidity (roughly). D.O. and B.O.D. values are to be obtained during the time that the recorder is in operation in order to correlate the various factors.

A general impression gained from the data is that there appears to be an interchange of groundwater and streamwater or a large contribution of groundwater quality to the streamwater that may include interchange. If this hypothesis is correct, then changes in ion concentrations should occur diurnally, and ion concentrations should increase markedly with low flows.

COMBINED REPORT OF THE SECRETARY AND OF THE EXECUTIVE COUNCIL FOR 1955-56

W. B. REDMOND, *Secretary*

There have been three meetings of the executive council during the past year; on September 30, 1954; February 11, 1955, and April 25, 1955. At present the council is composed of 18 members.

Though the past year in no sense can be considered a banner year it has been unquestionably a period of progress for the Georgia Academy of Science. One concrete illustration in support of this statement is the fact that 77 new members have been added. It is also true that about half this number have been lost to the Academy, some moving out of the state and either resigning or failing to renew their membership by payment of dues. The number of members on the roll at present is 534.

The first president-elect, Dr. George Seward, has been a member of the council for the past year and assumes the duties of president at the end of this annual meeting.

Section VII, science education, has enjoyed its first full year as an important part of the Academy, with Mrs. Helene Lammers, as chairman and Miss Louise Stakely as council representative. Dr. Katherine Omwake has been an important member of the council representing the Georgia Psychological Association. Mr. Eugene Sanders, director of the Georgia Junior Academy of Science, has met with the council by invitation and has kept the council members informed concerning the program and activities of the Junior Academy. The pending amendment to the constitution recommended

by the council at its meeting September 30, 1954, designates that the director of the Junior Academy become a member of the council. A liasion committee is authorized to aid in the coordination of the functioning of the Junior and Senior Academies.

The A.A.A.S. research grant was awarded by the Research Grants Committee to Mrs. Netta Gray of Agnes Scott for assisting her in continuing her studies on the conifers.

The Bulletin has been expanded and during the year 1954 volume 12 was published. This volume consisted of 124 pages. Illustrations and pictures have been incorporated in the articles published making publication of the results of research more inviting. W. B. Redmond has been appointed editor of the Bulletin by the executive council. The council authorized the editor to nominate editorial assistants for helping with the work of the Bulletin.

At the meeting held on April 25, 1955, the council voted to hold the 1956 annual meeting at the Georgia Institute of Technology.

As a result of the recent ballot the following officers were elected for 1955-56: President-elect, Dr. W. H. Duncan; vice-president, Miss Louise Stakely; secretary, Dr. Marion Clark; treasurer, Dr. J. G. Lester; historian, Dr. W. B. Baker; and member-of-council, Miss Lewis Lipps.

MINUTES OF THE GENERAL BUSINESS MEETING UNIVERSITY OF GEORGIA APRIL 29, 1955

The general business meeting of the Georgia Academy of Science was held in the library auditorium of the University of Georgia. The minutes of the preceding meeting were read and approved.

The secretary's report was combined with the report of the executive council.

The treasurer's report was read by the secretary in the absence of the treasurer, H. A. Robinson. The president stated that a committee had audited the treasurer's records and had found them to be in order.

T. W. Kethley, chairman of the constitution committee, stated that except for a few non-essential provisions the constitution was in admirable form to serve the Academy. He suggested that the chairman of the constitution committee be a member of the executive council in order to be better informed regarding the activities and needs of the Academy.

As a result of the ballot by mail the following officers were elected:
President-elect—Dr. Wilbur H. Duncan
Vice-President—Miss Louise Stakely
Secretary—Dr. Marion Clark
Treasurer—Dr. J. G. Lester
Historian—Dr. W. B. Baker
Member of Executive Council—Miss Lewis Lipps

The constitutional amendment officially recognizing the relationship of the Georgia Junior Academy of Science to the Georgia Academy of Science as recommended by the executive council at its meeting on September 30, 1954, was read by the secretary. It was stated that the amendment had been published in the Bulletin in December, 1954. It was moved and seconded that this amendment be adopted. The motion was passed by unanimous vote.

It was moved and seconded that the recommendation of the executive council that the Georgia Mineral Society be made an affiliate of the Georgia Academy of Science be accepted. This motion was passed by unanimous vote.

On recommendation of the council the following were elected fellows of the Georgia Academy of Science.

Dr. J. C. Sims, North Georgia College
Dr. Marion Clark, Emory University
Dr. Wilbur H. Duncan, University of Georgia
Dr. R. T. Osborne, University of Georgia
Dr. George C. Seward, Oglethorpe University
Dr. John Haldi, Emory University
Mrs. Frances Hall, High School, Atlanta
Colo. J. Edgar Morris, High School, Atlanta
Miss Louise Stakely, High School, Atlanta
Dr. J. W. Simmons, Emory University
Dr. B. R. Van Leer, Georgia Institute of Technology
Dr. T. H. Whitehead, University of Georgia
Dr. R. H. Rohrer, Emory University
Dr. W. D. Burbanck, Emory University
Dr. Horace O. Lund, University of Georgia
Miss Lewis Lipps, Shorter College
Dr. A. V. Beatty, Emory University
Dr. A. C. Clement, Emory University
Dr. Ernest L. Hunt, Emory University

President Furcron introduced Mr. Eugene Sanders, director of the Junior Academy of Science and asked him to give a brief report of the activities and accomplishments of the Junior Academy. Mr. Sanders gave a very interesting report of the State Science Fair held at Armstrong College, Savannah, on April 22-23, 1955.

COMMITTEES, 1955-56

Membership Committee
F. Homer Bell, Chm.
R. C. Sproull
H. T. Coggins
Elizabeth Crigler
Mrs. M. Gordon Brown
Gene Roberts
W. J. Proctor

Research Grants Committee
T. W. Kethley, Chm.

W. H. Jones
H. O. Lund

Academy Improvement Committee
W. H. Duncan, Chm.
Lewis Lipps
A. S. Furcron

Junior Academy Liasion Committee
Mrs. M. Gordon Brown
Mrs. Helen C. Richardson
Dr. Lane Mitchell
Dr. Kennedy Hodges

SECTION OFFICERS, 1955-56

SECTION:

I Mrs. Netta E. Gray, Chairman
Miss Thelma Howell, Secretary and Chairman-Elect
Dr. M. S. MacDougall, Representative

II Dr. Herbert W. Burrows, Chairman
Dr. William E. Eberhardt, Secretary
Dr. J. C. Simms, Representative

III Dr. A. R. Kelly, Chairman
Dr. Eldon J. Parizek, Secretary
Dr. H. W. Straley, III, Representative

IV Dr. J. H. Howey, Chairman
Dr. D. R. McMillan, Secretary
Dr. E. H. Dixon, Representative

V Dr. Stephen W. Gray, Chairman
Dr. Evangeline Papageorge, Secretary
Dr. Hudson Jost, Representative

VI ----------, Chairman
Dr. Rubin Gotesky, Representative

VII Mrs. Helene Lammers, Chairman
Miss Virginia Parker, Secretary
Mr. A. R. Varnedoe, Representative

SECTION REPORTS

SECTION I. BIOLOGY

Chairman: Wilbur H. Duncan
Secretary: Thelma Howell

The schedule of meetings were as follows:

FRIDAY, APRIL 29

Auditorium, Main Library

9:00 A.M. Presentation of Papers
11:30 A.M. Business Meeting
2:30 P.M. Panel Discussion, "Biological Research Opportuntities" Baldwin Hall, Room 311. Demonstration Papers. 4:30-5:30 P.M.

SATURDAY, APRIL 30

9:00 A.M. Presentation of Papers

BUSINESS MEETING

Chairman Wilbur H. Duncan called the meeting of the Section to order at 11:30 A.M., April 29, 1955.

Since the report of the annual meeting of the 1954 meeting had been published in the Bulletin of the Academy, it was voted to dispense with the reading of the report.

The chairman next called for a report from the Council Representative, Dr. Mary S. MacDougall. She summarized pertinent actions of the Executive Committee, and commented on the fine work of the chairman of the Biology Section, W. H. Duncan, in conducting the affairs of the Section during the current year.

Chairman Duncan explained that on the basis of the comments received in reply to his memorandum sent to the members regarding ways and means of obtaining greater continuity in the affairs of the Biology Section from year to year, he had appointed a Resolutions Committee composed of Robert Wheeler, chairman, A. L. Cohen, Josephine Bridgman, John Foster, Clara Hamilton, and J. D. Anthony to bring recommendations for consideration of the membership. The report given by Robert Wheeler was taken up item by item. Two suggestions, viz., one having to do with a time limit on papers and another concerning an invitation to students to present their work at the Academy meetings, evoked much discussion. As finally passed the recommendations follow:

1. That the secretary of the Biology Section shall be the chairman-elect for the following year.
2. That the Biology Section have a committee to contact and invite prospective mmebers. It is suggested that the members of the committee represent many geographical areas of the State.
3. That a committee on symposia be appointed. It is suggested that the committee be composed of six members representing varied biological interests. At the outset, three of these members shall be appointed for one-year and three for two-year terms, and each year thereafter three new members shall be appointed for two-year terms. That symposia topics have broad implications in areas of common interests.
4. That papers should be limited to ten (10) minutes except at the discretion of the chairman and secretary.
5. That high school students who have prepared outstanding exhibits or demonstrations or papers, as well as graduate or undergraduate students who have completed scientific work, be invited to present their work.

The Nomination Committee, composed of E. P. Odum and J. J. Westfall, offered the following slate:

Chairman: Netta E. Gray, Agnes Scott College

Secretary and Chairman-elect: Thelma Howell, Wesleyan College

There were no nominations from the floor. E. P. Odum moved the election of the slate of officers. Motion seconded and passed.

There being no further business the meeting adjourned to meet at Georgia Tech in 1956.

THELMA HOWELL, *Secretary*

SECTION III

EARTH SCIENCE SECTION

Nineteen papers were presented before the Earth Science Section in sessions held Friday morning and afternoon and Saturday morning, April 29-30, 1955, in Athens, Georgia. Although the majority of papers were geological in content, several very interesting papers of geographical and archaeological interest were included in this year's program. The session were all well attended.

Mr. Nelson Severinghaus, Chairman, was the only retiring officer from the Earth Science Section, and was succeeded by Dr. A. R. Kelly of the Department of Sociology and Anthropology, University of Georgia. Re-elected officers were Dr. H. W. Straley, Council Representative, and Dr. E. J. Parizek, Secretary.

E. J. PARIZEK, *Secretary*

SECTION IV

PHYSICS, MATHEMATICS AND ENGINEERING

The officers elected to serve Section IV (Physics, Mathematics, and Engineering) of the Georgia Academy of Sciences are as following:

Chairman—Dr. J. H. Howey, Georgia Tech

Secretary—Dr. D. R. McMillan, Emory University

Representative to Executive Council—Dr. E. H. Dixon, University of Georgia

The two meetings of Section IV on Friday had an average attendance of 30 and the papers were presented exceptionally well. We hope to improve the continuity of the programs from year to year.

E. H. DIXON

SECTION V

PSYCHOLOGY AND MEDICINE SECTION

At the business meeting of Section V the following officers were elected:

Representative on the Council (for a three year term): Dr. Hudson Jost, Department of Psychology, University of Georgia, Athens, Ga.

Chairman for 1955-56: Dr. Stephen W. Gray, Department of Anatomy, Emory University, Emory University, Ga.

Secretary: Dr. Evangeline Papageorge, Department of Biochemistry, Emory University, Ga.

The papers were of excellent quality and aroused much interest. The "Symposium on Problems of Aging," presented in the afternoon, drew an enthusiastic audience of members of the section and of visitors, who participated in an animated discussion, and expressed their appreciation of the able presentation of this vital problem. Dr. Herman W. Michael presided as moderator over the panel of specialists which included Dr. Anna Greene Smith, Dr. Albert Lansing, Dr. J. Elliott Scarborough, Dr. Austin S. Edwards, and Mr. Wellborn R. Ellis.

KATHARINE T. OMWAKE, *Chairman*

SECTION VII

SCIENCE EDUCATION

At the annual meeting of the Georgia Academy of Science eleven papers and demonstrations were presented. Of this number three were by invitation, these being of general interest to all. Active interest was evidenced by the lively discussion period.

The following were elected as officers for the coming year at the business session:

Council representative to fill the unexpired term of Miss Louise Stakely, newly-elected vice-president of the Academy, Mr. Ashton C. Varnedoe, Savannah.

Secretary—Miss Virginia Parker of Jordan Vocational School, Columbus

Chairman—Mrs. Helene Norwood Lammers, Atlanta.

HELENE NORWOOD LAMMERS,
Chairman-Secretary

THE 1955 DIRECTORY

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